FILE COPY FOREST INSECT LABORATORY, STANFORD UNIVERSITY CALIFORNIA.

463.3
485

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PLANT INDUSTRY

OFFICE OF FOREST PATHOLOGY

Title: TREE DYING FROM PATHOLOGICAL CAUSES IN THE VICINITY OF LAKE TAHOE.

Author: Willis W. Wagener.

To .....

From .....

For information

For criticism

To be published in .....

Please forward to .....

Date Sept. 27, 1930.

U. S. GOVERNMENT PRINTING OFFICE: 1928 107458

September 27, 1930.

TREE DYING FROM PATHOLOGICAL CAUSES IN THE VICINITY OF LAKE TAHOE.

Inquiries regarding the condition of trees and shrubs in the Lake Tahoe area have been considerably more numerous this year than heretofore. With the activity in the subdivision of holdings in recent years and the accompanying increases in land and tree values, numbers of individual property owners and disturbance of natural forest conditions, some increase in inquiries was to be expected but the number received was sufficiently in excess of this expectancy to indicate a distinct rise in the amount of tree dying around the Lake.

Observations have confirmed this indication. Not only does the dying from attacks by insects such as the fir engraver beetle appear to have increased but there has been a marked increase in damage and dying from other causes.

The present report is a composite of observations made on two trips to the Lake by the writer during August and of conditions noted along the north and west portions by Messrs. Wright and Gill of this office during the latter part of July. One trip by the writer was in company with Senior Entomologist J. M. Miller of the Office of Forest Entomology and a portion of the other with Professor S. B. Doten, Director of the Nevada Agricultural Experiment Station who had previously made an examination of conditions in the Glenbrook area. Due to the closing of the road by construction,

5 copies; sent
Herbert (10/30)
~~Salman (11/30)~~

LPB

no examination of the portion of the east shore between Glenbrook and Brockway was practicable.

Location and Causes of Damage.

Tree dying from insect attacks, particularly the dying of white fir from the attack of the fir engraver beetle, is noticeable all around the Lake. The situation from the insect standpoint is dealt with in a report by Senior Entomologist Miller. Tree diseases and damage from other causes were noted as follows:

Brockway to Tahoe City - White fir along this portion of the Lake and along the main highway from Tahoe to Truckee is suffering from branch dying due to a fungus (Cytospora Sp.) which works in the inner bark, finally killing it and girdling the affected part. The disease seems to be more prevalent on young trees than on old though the latter do not escape attack. It occurs characteristically on the lower branches, working from here toward the top. Trees up to 15 feet in height may be entirely killed through the individual death of the lower side branches and the girdling of the main stem toward the top. Under favorable conditions the yellowish fruiting tendrils of the fungus, consisting of threads of spores, may be seen extruded from the affected bark. These spore tendrils are one of the best means of recognizing the fungus.

Infection is spotted in occurrence around this part of the Lake, being quite heavy in some places and almost absent in others. Along the highway to Truckee the disease has increased

markedly during the past year and on the younger firs growing on the slope to the west of the road the dying has been so pronounced that it looks as if the trees had been scorched by a fire. Much of the dying along the northeast portion of the Lake also appears to have taken place during the past year though scattering older dead branches bearing the pycnidia of the fungus indicate that it had become established there previously. The trees attacked by the fungus often prove attractive to the fir engraver beetle which completes the killing by girdling the remaining live stem.

No other diseases of importance were noted between Tahoe City and Brockway.

Tahoe City to State Line - Along the west and south shores of the Lake insects are the main cause of trouble. The Cytospora fungus is present in a number of places but has not become aggressive. Mistletoe is a serious pest on Jeffrey and Lodgpole pines in a few areas but on account of reasonably favorable growing conditions for the trees the actual killing from the parasite has been limited. A rust (Peridermium filamentosum var. stalactiforme) also occurs locally on Jeffrey pine in a few places between Tahoe Tavern and Homewood but is not serious.

At the south end of the Lake between it and Fallen Leaf, a needle disease due to a fungus (Hypoderma deformans) is present on Jeffrey pine but has been less severe this sea-

son than in some former ones. When heavy, all but the tips of affected trees may turn red, giving them a fire-scorched appearance. The disease seldom kills the host tree but growth is stunted, foliage becomes thin and the crown tends to become bushy.

State Line to Glenbrook - The stand on the east side of the Lake is predominantly second growth Jeffrey pine with only scattering white fir and incense cedar except for a few moist draws and local north exposures where the latter two species are found in greater abundance. In general, conditions for tree growth as compared with those on the west shore are more severe and with the subnormal precipitation of recent years an increasing number of trees have been unable to survive. The effects of thin, rocky soil, exposure to the drying action of the strong afternoon winds and the deficiency in normal moisture are particularly apparent in the vicinity of Cave Rock where dying has been heavy for several years past.

Infection by the yellow pine mistletoe is much heavier and more widely distributed than on the west side of the Lake. Main stem infections by this parasite are numerous on the younger Jeffrey pines and with the unfavorable moisture conditions, have been primarily responsible for the death of many trees. This is particularly true for the south slope of the ridge back of Glenbrook and in the section around Zephyr

Cove though dying from heavy infections of the parasite is by no means limited to these areas.

The Cytospora bark disease has been very active on white fir along the east side of the Lake during the past year and a large percentage of the young trees of this species have either been killed or are so badly damaged that they will ultimately succumb, either from further inroads of the fungus or from attack by fir engraver beetles.

On the open west slopes, particularly where the soil is sandy, physiological die-back of the scattering young incense cedars which had become established there is estimated to have eliminated from 50 to 75 per cent of the reproduction of this species. The dying is similar to that which occurred in Douglas fir, incense cedar and other species in many parts of the State last spring and had its origin in the exceptionally long drawn out, dry fall of 1929.

Top killing of Jeffrey pines by porcupines was noted locally in several places. These animals gnaw the succulent bark of the main stem in the tops of the trees, frequently girdling them.

In addition to dying from the causes outlined there has been considerable careless burning of material cleared from road rights of way, etc. along the east side of the Lake and the resulting killing and scorching of trees adds to the unsatisfactory picture created by the parasites and drought.

Possibilities for Control.

Considering the region around the Lake as a whole, the two most important factors in the dying, aside from insects and drought, are mistletoe and the Cytospora bark disease of white fir.

For the mistletoe no means of extensive control applicable to the Tahoe region can be recommended. The parasite is a flowering plant with its vital parts embedded in the bark and wood of the host tree and no spray or chemical treatment has yet been discovered which will kill the mistletoe without at the same time killing the branch or stem of the tree bearing it. Local control by means of pruning out of infections is often practicable however, due to the fact that the spread of the parasite is limited almost entirely to the explosive ejection of the seed from the seed coats on ripening. As the seed are relatively heavy, dispersal by this means is restricted to short distances. It is thus often possible for an owner to undertake control measures on his own land with considerable success even though other owners in the neighborhood do not cooperate by carrying out similar measures. He may even confine his control efforts to a particular small part of his holdings with satisfactory results.

The feasibility of local control by pruning out of infections in any individual case will depend on the amount and distribution of the mistletoe present and the size of infected trees. If infection is uniformly heavy or if the trees are of mature size, the pruning out method is almost out of the question. On the other hand if the situation is one in which the mistletoe is invading a stand of young trees and has not been present long enough for infection to become heavy the pruning method offers decided possibilities.

Even under favorable conditions one cannot expect to secure complete eradication of the parasite by the pruning out method except after an annual follow-up for a number of years. This is due to the 3 to 5 year period elapsing between the dispersal of the seed and the development of new plants from them. Thus, for example, the 1930 seed crop of the mistletoe would produce new plants which would not appear until 1933 to 1935 and during most of the intervening period the presence of the infections would not even be indicated by branch swellings. Observations on experimental plots where pruning has been carried out indicate that latency even beyond the five year period may occur.

It is not necessary to secure complete eradication however, to make control measures worth while. Reduction of the parasite to a point where it can do little harm and where further appearance of infection can be readily handled is

attainable by the first pruning operation, and should be the criterion on which the success of the initial measures is judged. In most instances where recreational areas are in consideration it is doubtful whether all the infections which it is possible to remove should be taken out as the pruning is going to result in some disfiguration of the host trees and it may be that the latter would be more objectionable than the presence of the mistletoe. In such cases the judgment of the operator must be exercised as to what should be removed and what left. It is more important to remove female plants than the male since the seed or berries are produced only on the former and if they are removed no further infection can take place. Where female infections cannot be removed without serious disfigurement to a tree, the seed bearing shoots should be kept rubbed off so as to prevent seed production. Even where no pruning is done the latter precaution can be taken and in time should result in a distinct improvement in conditions. In fact, in the case of a very heavily infected stand of trees within working distance of the ground, this and the betterment of growing conditions for the trees by supplying additional water and humus materials are about the only measures which can be applied. Control work, either pruning or removal of shoots should be carried out during the summer before the mistletoe berries begin to ripen and shoot out. In pruning, the cuts

should be made at least 2 inches back of the lower limit of the swelling in order to be sure of removing all the infected bark and wood. If this is not all reached, new growth may take place from what remains.

Not enough is known regarding the Cytospora bark disease of white fir to make any satisfactory recommendations for control outside of the general one, applicable to almost any disease, that the cutting out and burning of diseased trees or parts of trees will probably reduce the chances for spread. For small trees which it is desired to protect, spraying with a good fungicide such as Bordeaux mixture (not over 4-4-50 strength) might be tried, with attention given to complete coverage on the main stem and branches rather than on the foliage.

Control of the Hypoderma needle disease has not so far proven practicable under forest conditions. Where protection for individual trees is desired, the Bordeaux spray, applied in the spring or fall or at both seasons, might prove helpful.

General Preventive Suggestions.

In almost every area devoted to summer homes and recreational purposes it is very common to see trees placed under decided handicaps for growth through soil compacting, removal of humus materials and the covering of the soil surface over the roots with buildings, oiled driveways, etc. which prevent the percolation of a normal moisture supply.

As Dr. E. P. Meinecke has pointed out in connection with his investigations of trees in National and State Parks and in public camp grounds, the compacting of the soil around trees by heavy public use or other means causes a profound change in root development, leading to a great reduction in their absorptive capacity. Trees so handicapped are more likely to succumb to drought or to the attacks of insects.

A particularly common practice among owners in recreational areas is to rake up and burn, or to broadcast burn the litter and duff on the ground, thus cutting off the supply of materials for maintaining the humus content of the soil. Humus is not only the chief source of food supply for trees but assists very materially in increasing the water holding capacity of the soil. In the sandy soils, such as occur on the south and east shores of Lake Tahoe, the maintenance of the humus supply is particularly essential.

Owners interested in the future of their trees will do well to consider carefully the location and extent of walks, drives and other areas of heavy use, restricting them to a minimum compatible with needs and placing them so that as little as possible of the root areas of the trees will be affected. It should be remembered in considering this question that tree roots often spread to a distance greater than that of the branches and that most of the feed-

ing roots are located relatively close to the surface. The ground not required for walks and drives should be left as nearly under natural conditions as possible.

Other Recommendations.

In view of the advance which the Cytospora bark disease has apparently made in the white fir stands of the Tahoe region during the last year or two and considering the property values which would be jeopardized should the disease continue to spread at an epidemic rate, it seems almost essential that more should be learned regarding the disease and its potentialities than is now known. It is felt that a thorough study of the problem should be made as soon as possible. On account of the inter-relations with the fir engraver beetle problem on which study appears also to be urgently needed, it would seem very desirable to have investigation of the two undertaken concurrently. With the funds at present available, however, it is very unlikely that the pathological portion of the suggested concurrent investigation can be undertaken.

Willis W. Wagener,

Pathologist.